Brock M&S Presentation

Fall 2024

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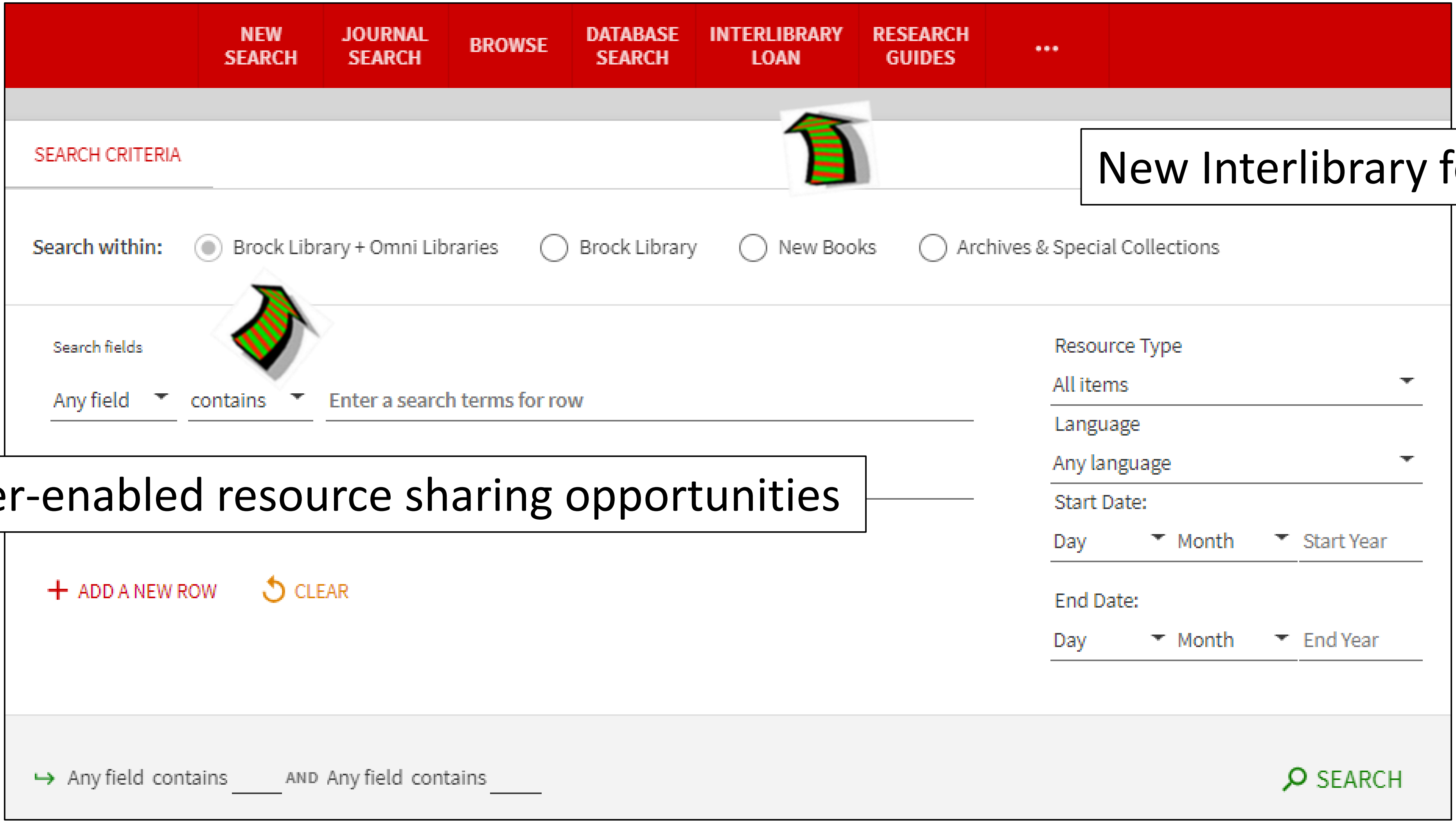

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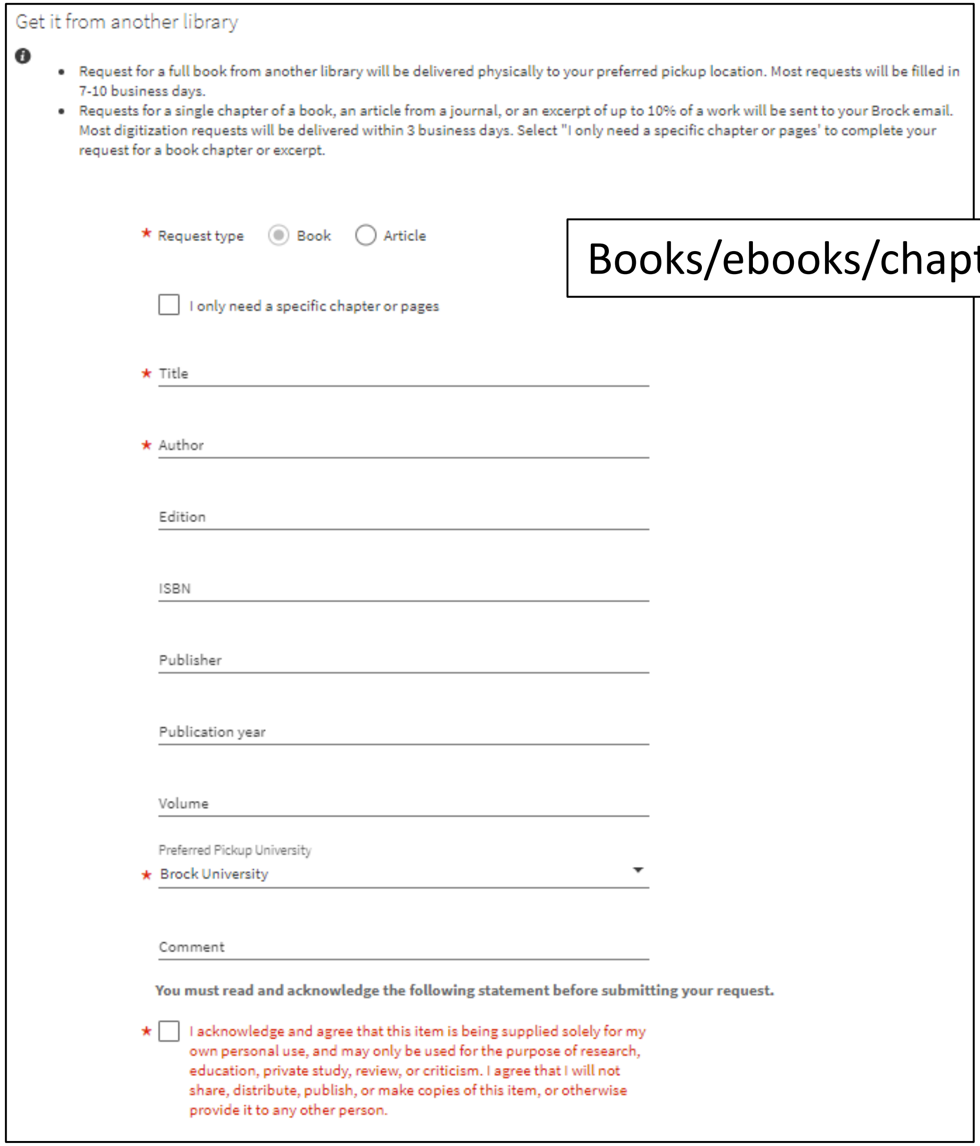

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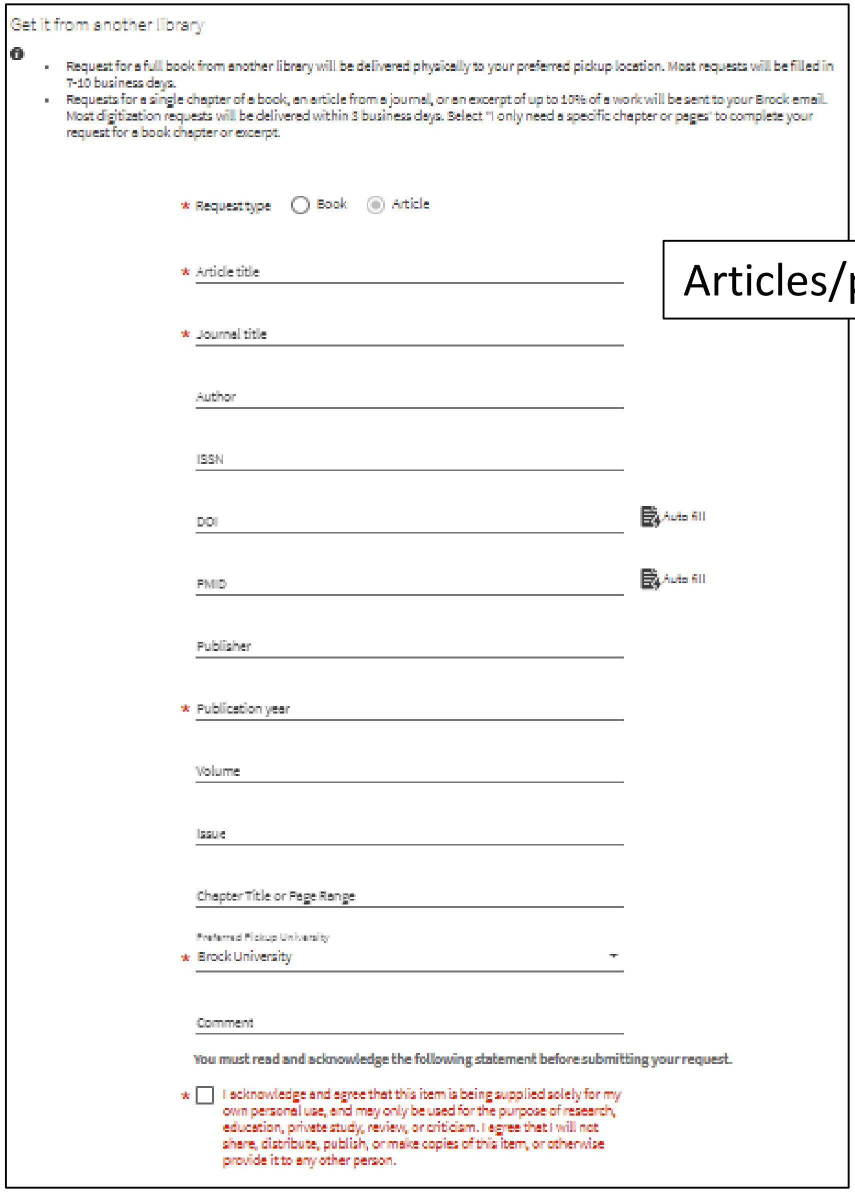

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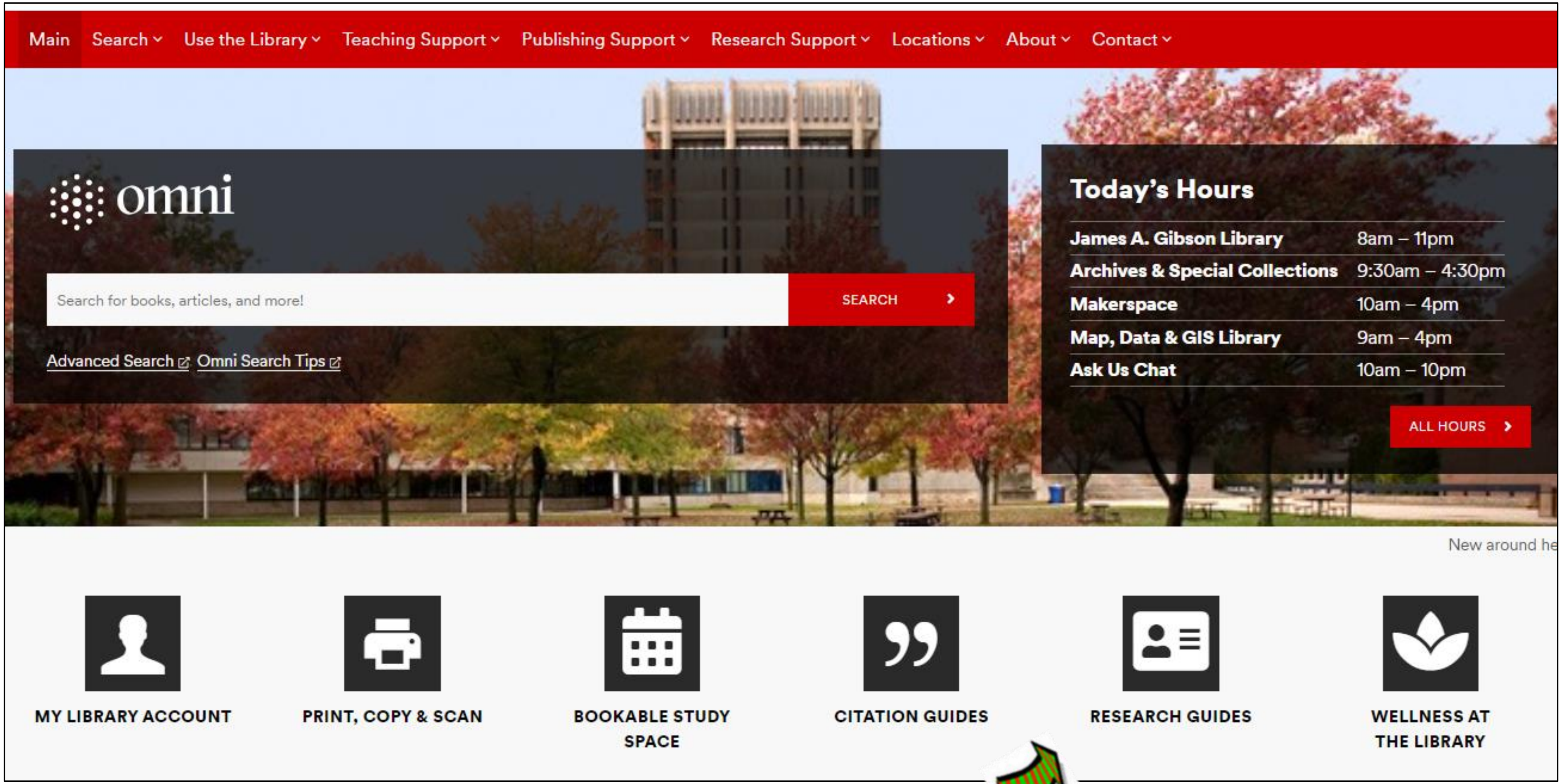

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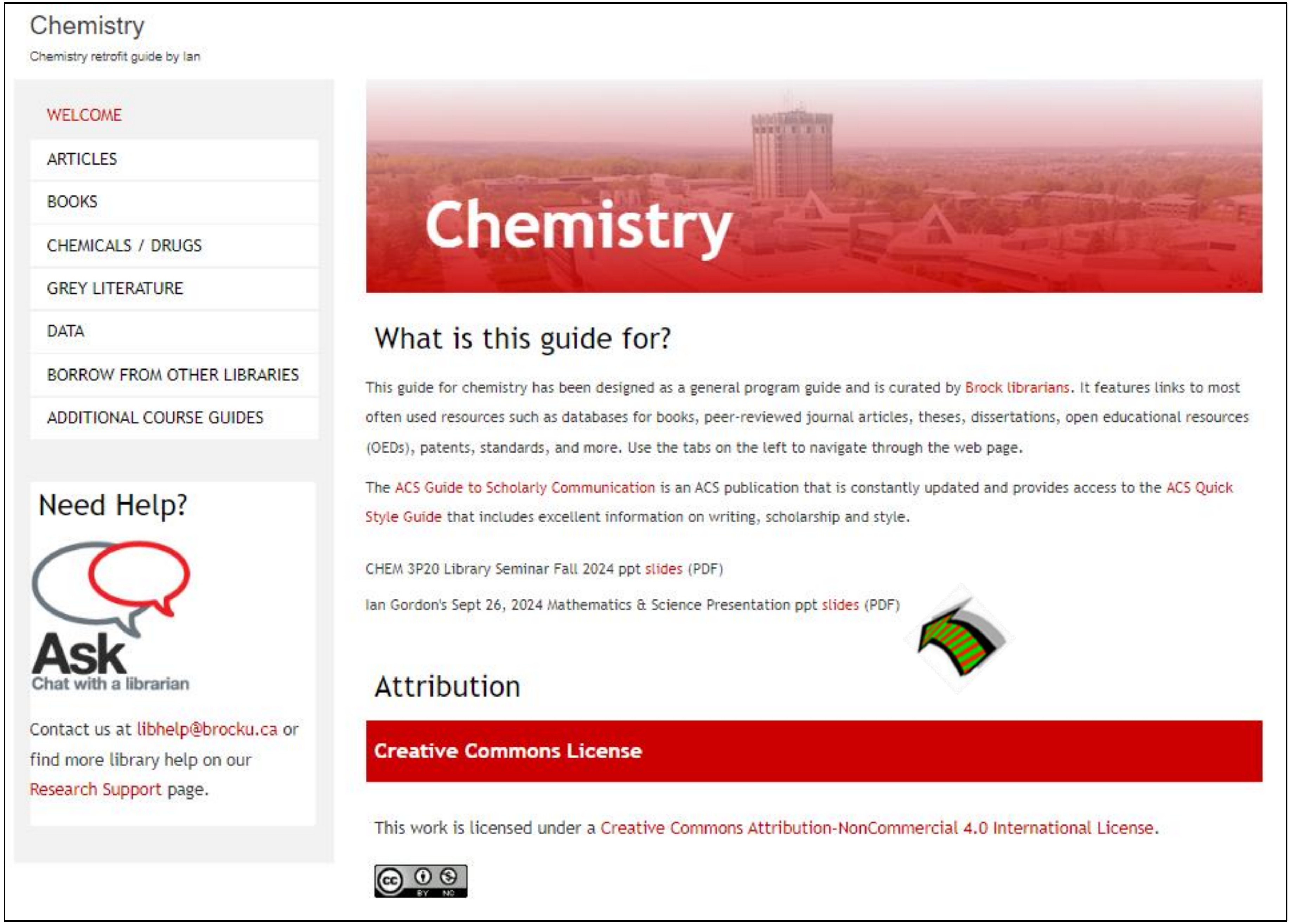

Chemistry

Chemistry retrofit guide by Ian

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CHEM 3P20 Library Seminar Fall 2024 ppt slides (PDF)

Ian Gordon's Sept 26, 2024 Mathematics & Science Presentation ppt slides (PDF)

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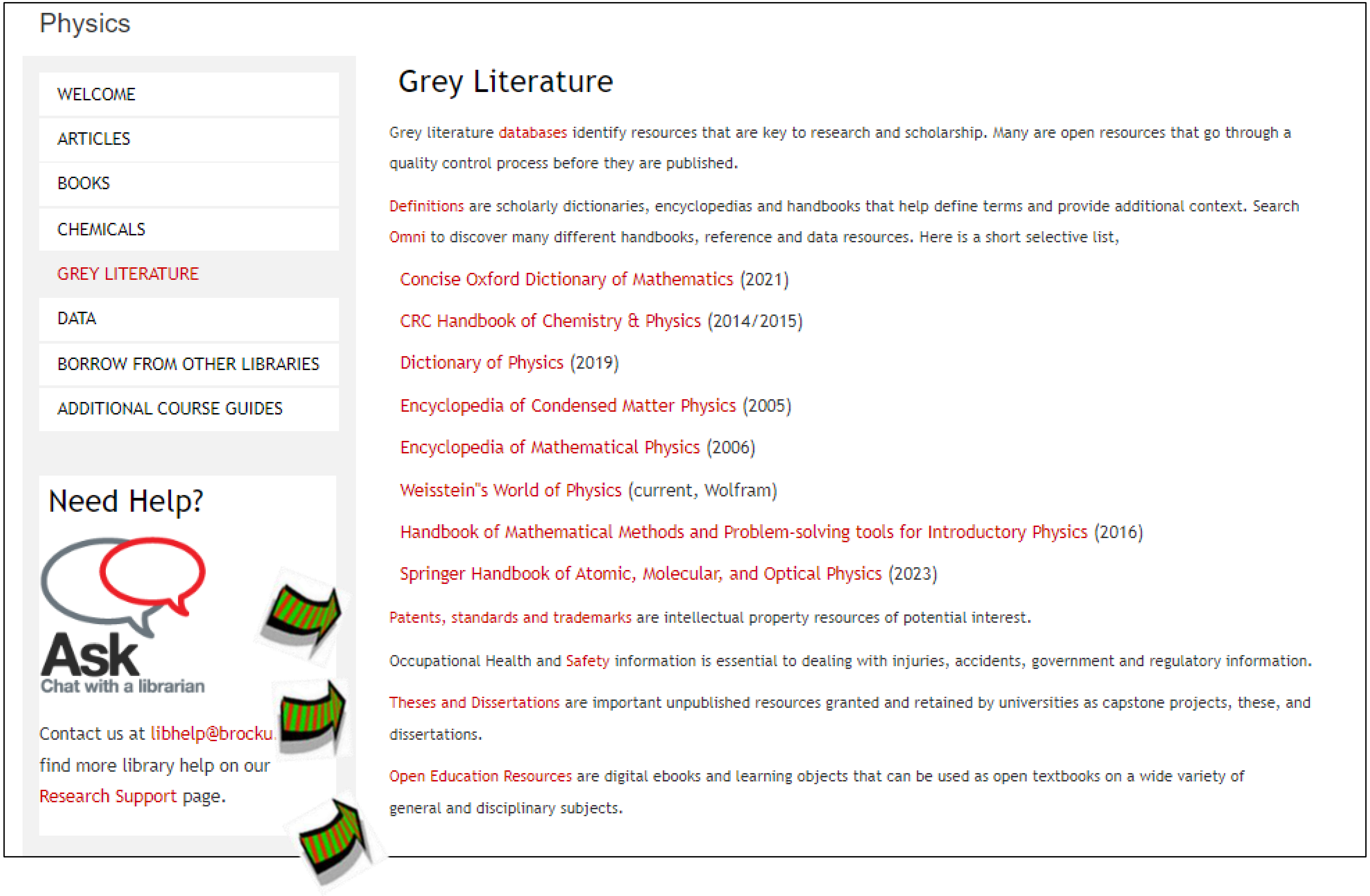

Physics

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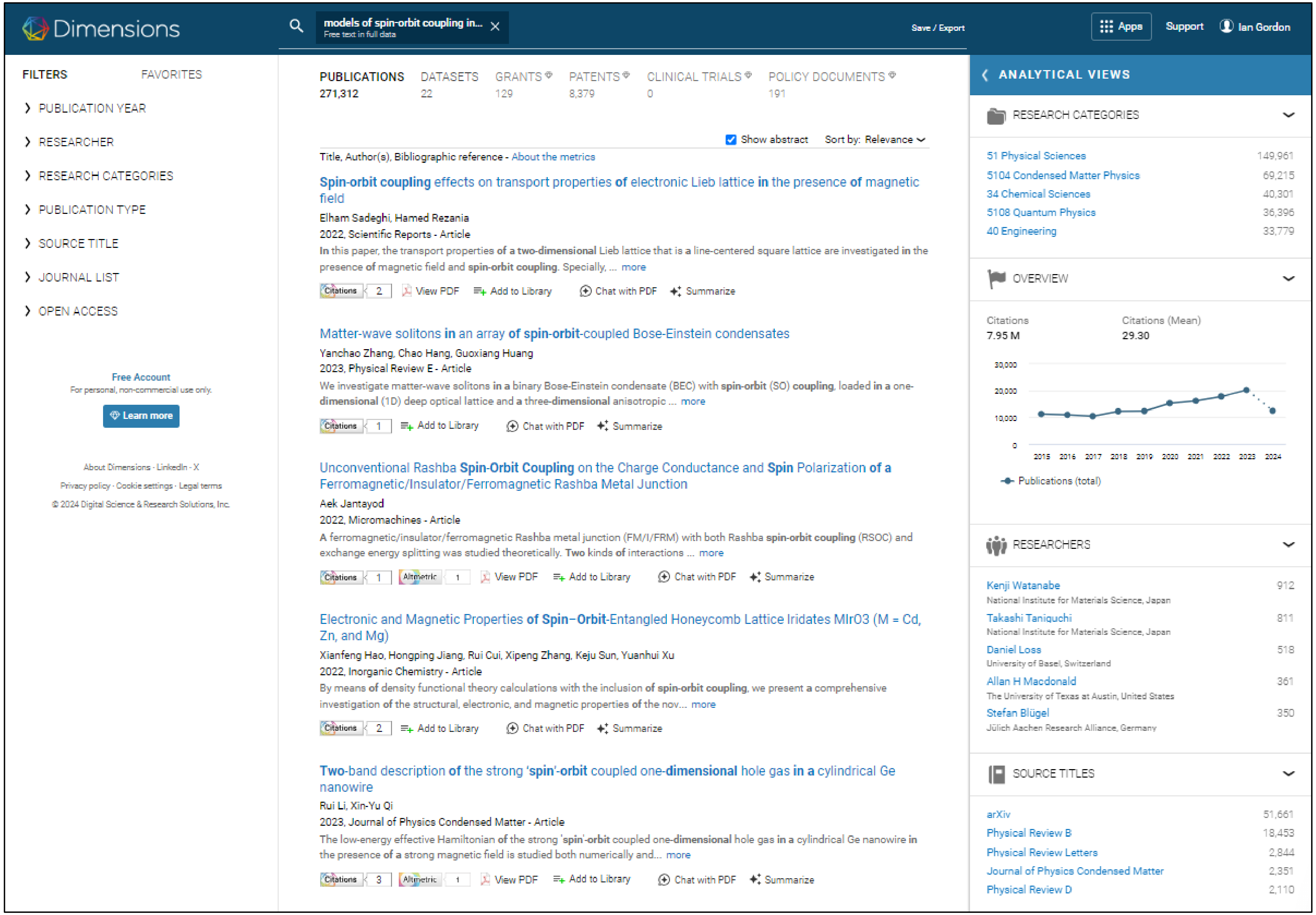

Title, Author(s), Bibliographic reference - About the metrics

Spin-orbit coupling effects on transport properties **of** electronic Lieb lattice **in** the presence **of** magnetic field

Elham Sadeghi, Hamed Rezania

2022, Scientific Reports - Article

In this paper, the transport properties **of a two-dimensional** Lieb lattice that is **a** line-centered square lattice are investigated **in** the presence **of** magnetic field and **spin-orbit coupling**. Specially, ... more

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Yanchao Zhang, Chao Hang, Guoxiang Huang

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We investigate matter-wave solitons **in a** binary Bose-Einstein condensate (BEC) with **spin-orbit** (SO) **coupling**, loaded **in a** one-**dimensional** (1D) deep optical lattice and **a** three-**dimensional** anisotropic ... more

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Citations	Citations (Mean)
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RESEARCHERS

Kenji Watanabe National Institute for Materials Science, Japan	912
Takashi Taniguchi National Institute for Materials Science, Japan	811
Daniel Loss University of Basel, Switzerland	518
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SOURCE TITLES

arXiv	51,661
Physical Review B	18,453
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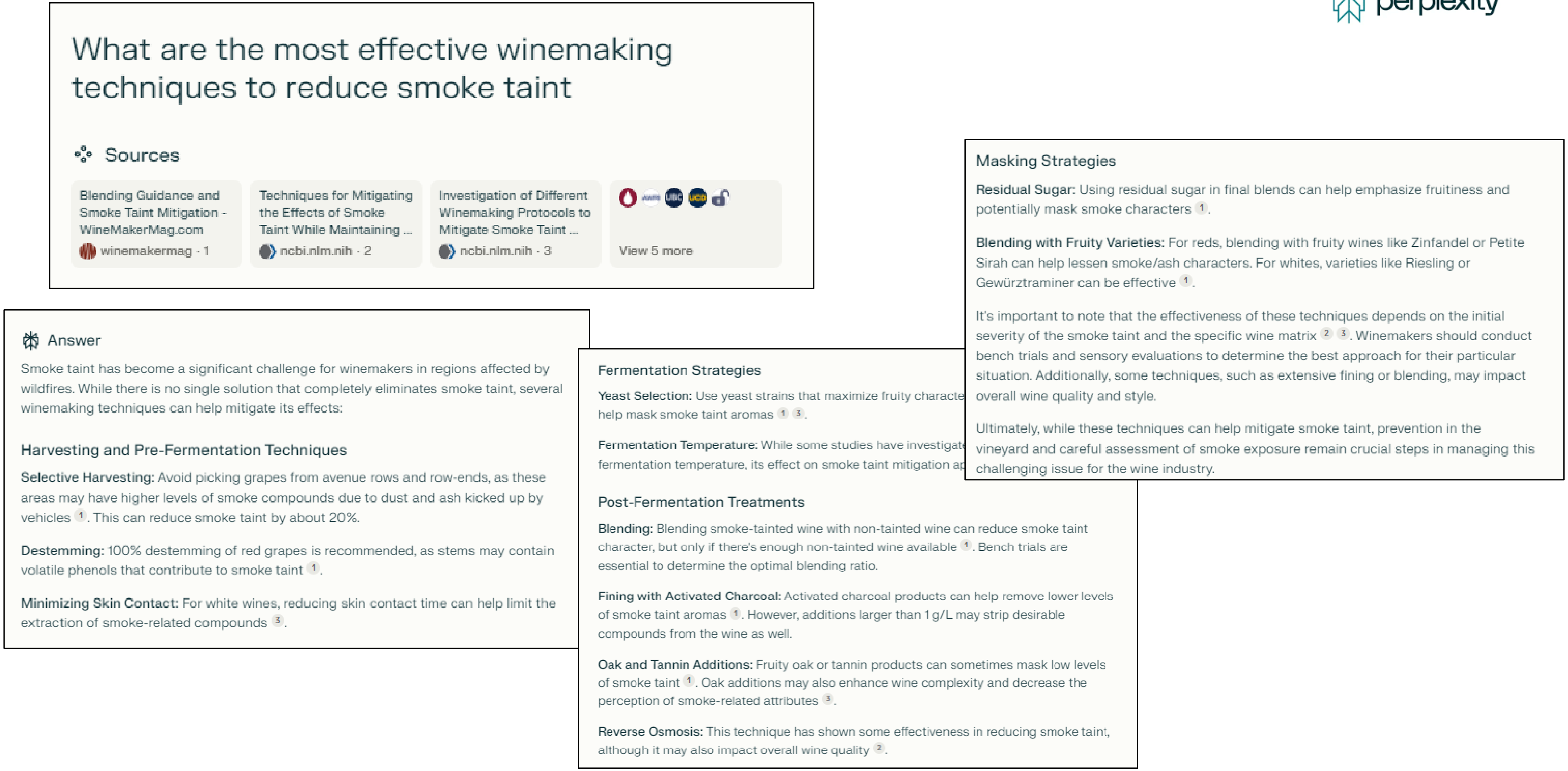

What are the most effective winemaking techniques to reduce smoke taint

Sources

- Blending Guidance and Smoke Taint Mitigation - WineMakerMag.com — winemakermag · 1
- Techniques for Mitigating the Effects of Smoke Taint While Maintaining ... — ncbi.nlm.nih · 2
- Investigation of Different Winemaking Protocols to Mitigate Smoke Taint ... — ncbi.nlm.nih · 3
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Answer

Smoke taint has become a significant challenge for winemakers in regions affected by wildfires. While there is no single solution that completely eliminates smoke taint, several winemaking techniques can help mitigate its effects:

Harvesting and Pre-Fermentation Techniques

Selective Harvesting: Avoid picking grapes from avenue rows and row-ends, as these areas may have higher levels of smoke compounds due to dust and ash kicked up by vehicles [1]. This can reduce smoke taint by about 20%.

Destemming: 100% destemming of red grapes is recommended, as stems may contain volatile phenols that contribute to smoke taint [1].

Minimizing Skin Contact: For white wines, reducing skin contact time can help limit the extraction of smoke-related compounds [3].

Fermentation Strategies

Yeast Selection: Use yeast strains that maximize fruity characte help mask smoke taint aromas [1] [3].

Fermentation Temperature: While some studies have investigate fermentation temperature, its effect on smoke taint mitigation ap

Post-Fermentation Treatments

Blending: Blending smoke-tainted wine with non-tainted wine can reduce smoke taint character, but only if there's enough non-tainted wine available [1]. Bench trials are essential to determine the optimal blending ratio.

Fining with Activated Charcoal: Activated charcoal products can help remove lower levels of smoke taint aromas [1]. However, additions larger than 1 g/L may strip desirable compounds from the wine as well.

Oak and Tannin Additions: Fruity oak or tannin products can sometimes mask low levels of smoke taint [1]. Oak additions may also enhance wine complexity and decrease the perception of smoke-related attributes [3].

Reverse Osmosis: This technique has shown some effectiveness in reducing smoke taint, although it may also impact overall wine quality [2].

Masking Strategies

Residual Sugar: Using residual sugar in final blends can help emphasize fruitiness and potentially mask smoke characters [1].

Blending with Fruity Varieties: For reds, blending with fruity wines like Zinfandel or Petite Sirah can help lessen smoke/ash characters. For whites, varieties like Riesling or Gewürztraminer can be effective [1].

It's important to note that the effectiveness of these techniques depends on the initial severity of the smoke taint and the specific wine matrix [2] [3]. Winemakers should conduct bench trials and sensory evaluations to determine the best approach for their particular situation. Additionally, some techniques, such as extensive fining or blending, may impact overall wine quality and style.

Ultimately, while these techniques can help mitigate smoke taint, prevention in the vineyard and careful assessment of smoke exposure remain crucial steps in managing this challenging issue for the wine industry.

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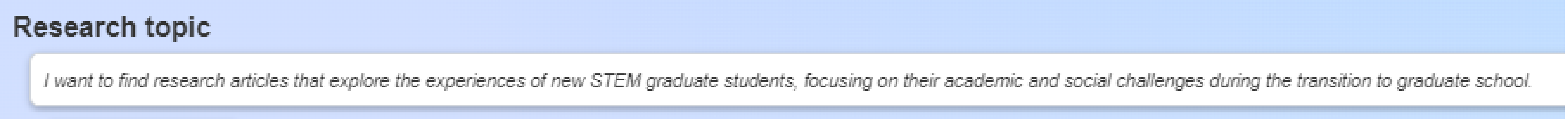
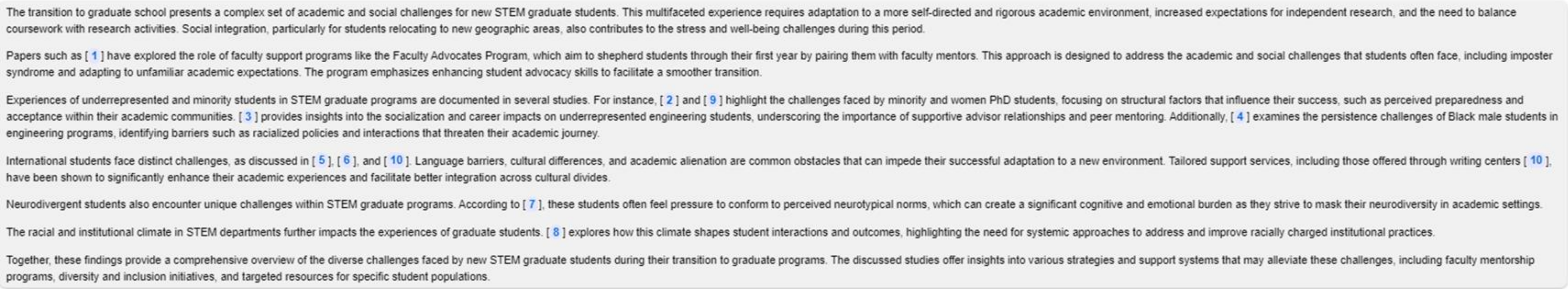


Research topic

I want to find research articles that explore the experiences of new STEM graduate students, focusing on their academic and social challenges during the transition to graduate school.



The transition to graduate school presents a complex set of academic and social challenges for new STEM graduate students. This multifaceted experience requires adaptation to a more self-directed and rigorous academic environment, increased expectations for independent research, and the need to balance coursework with research activities. Social integration, particularly for students relocating to new geographic areas, also contributes to the stress and well-being challenges during this period.

Papers such as [1] have explored the role of faculty support programs like the Faculty Advocates Program, which aim to shepherd students through their first year by pairing them with faculty mentors. This approach is designed to address the academic and social challenges that students often face, including imposter syndrome and adapting to unfamiliar academic expectations. The program emphasizes enhancing student advocacy skills to facilitate a smoother transition.

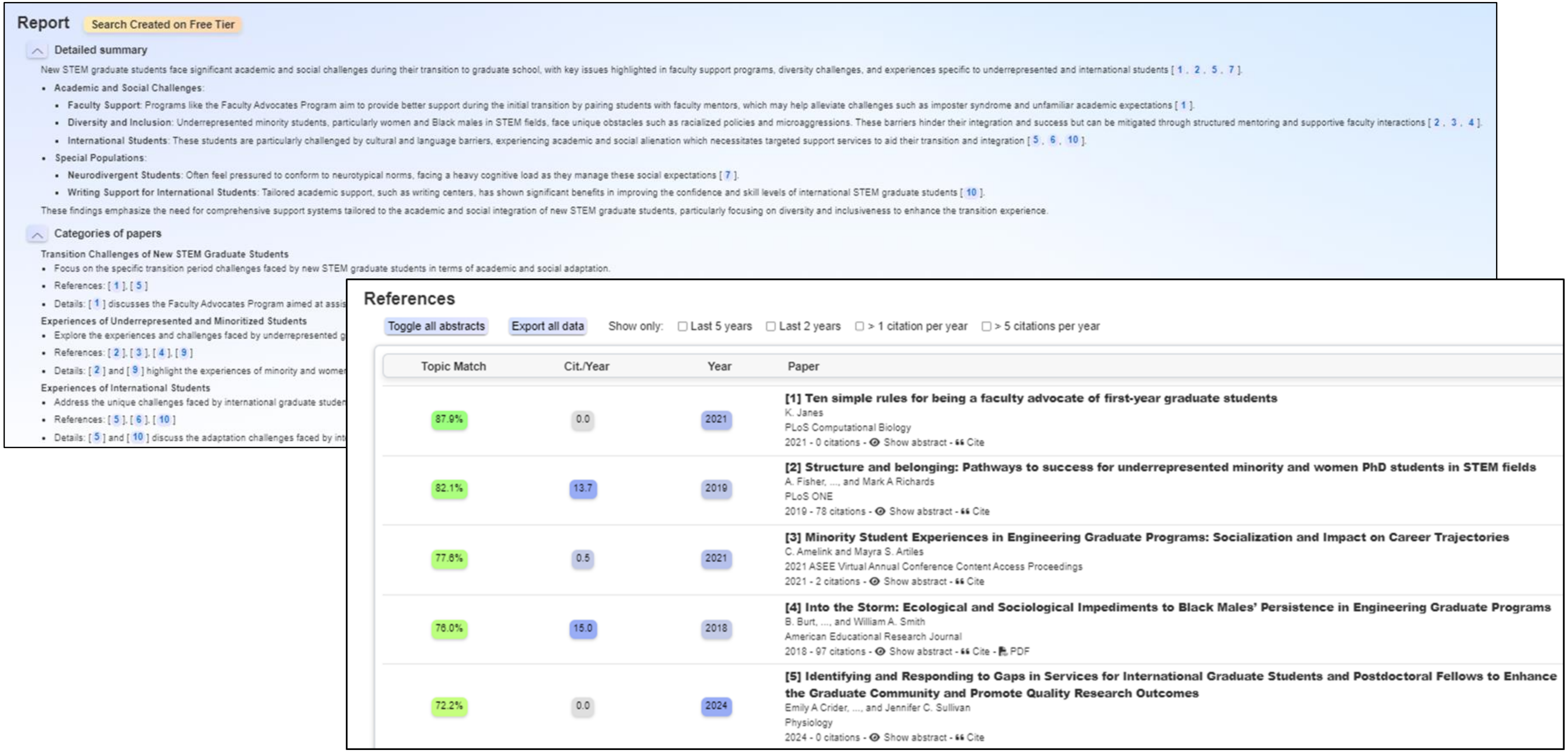
Experiences of underrepresented and minority students in STEM graduate programs are documented in several studies. For instance, [2] and [9] highlight the challenges faced by minority and women PhD students, focusing on structural factors that influence their success, such as perceived preparedness and acceptance within their academic communities. [3] provides insights into the socialization and career impacts on underrepresented engineering students, underscoring the importance of supportive advisor relationships and peer mentoring. Additionally, [4] examines the persistence challenges of Black male students in engineering programs, identifying barriers such as racialized policies and interactions that threaten their academic journey.

International students face distinct challenges, as discussed in [5], [6], and [10]. Language barriers, cultural differences, and academic alienation are common obstacles that can impede their successful adaptation to a new environment. Tailored support services, including those offered through writing centers [10], have been shown to significantly enhance their academic experiences and facilitate better integration across cultural divides.

Neurodivergent students also encounter unique challenges within STEM graduate programs. According to [7], these students often feel pressure to conform to perceived neurotypical norms, which can create a significant cognitive and emotional burden as they strive to mask their neurodiversity in academic settings.

The racial and institutional climate in STEM departments further impacts the experiences of graduate students. [8] explores how this climate shapes student interactions and outcomes, highlighting the need for systemic approaches to address and improve racially charged institutional practices.

Together, these findings provide a comprehensive overview of the diverse challenges faced by new STEM graduate students during their transition to graduate programs. The discussed studies offer insights into various strategies and support systems that may alleviate these challenges, including faculty mentorship programs, diversity and inclusion initiatives, and targeted resources for specific student populations.



Report

Detailed summary

New STEM graduate students face significant academic and social challenges during their transition to graduate school, with key issues highlighted in faculty support programs, diversity challenges, and experiences specific to underrepresented and international students [1 , 2 , 5 , 7].

- **Academic and Social Challenges**:
  - **Faculty Support**: Programs like the Faculty Advocates Program aim to provide better support during the initial transition by pairing students with faculty mentors, which may help alleviate challenges such as imposter syndrome and unfamiliar academic expectations [1].
  - **Diversity and Inclusion**: Underrepresented minority students, particularly women and Black males in STEM fields, face unique obstacles such as racialized policies and microaggressions. These barriers hinder their integration and success but can be mitigated through structured mentoring and supportive faculty interactions [2 , 3 , 4].
  - **International Students**: These students are particularly challenged by cultural and language barriers, experiencing academic and social alienation which necessitates targeted support services to aid their transition and integration [5 , 6 , 10].
- **Special Populations**:
  - **Neurodivergent Students**: Often feel pressured to conform to neurotypical norms, facing a heavy cognitive load as they manage these social expectations [7].
  - **Writing Support for International Students**: Tailored academic support, such as writing centers, has shown significant benefits in improving the confidence and skill levels of international STEM graduate students [10].

These findings emphasize the need for comprehensive support systems tailored to the academic and social integration of new STEM graduate students, particularly focusing on diversity and inclusiveness to enhance the transition experience.

Categories of papers

Transition Challenges of New STEM Graduate Students

- Focus on the specific transition period challenges faced by new STEM graduate students in terms of academic and social adaptation.
- References: [1], [5]
- Details: [1] discusses the Faculty Advocates Program aimed at assis

Experiences of Underrepresented and Minoritized Students

- Explore the experiences and challenges faced by underrepresented g
- References: [2], [3], [4], [9]
- Details: [2] and [9] highlight the experiences of minority and women

Experiences of International Students

- Address the unique challenges faced by international graduate studen
- References: [5], [6], [10]
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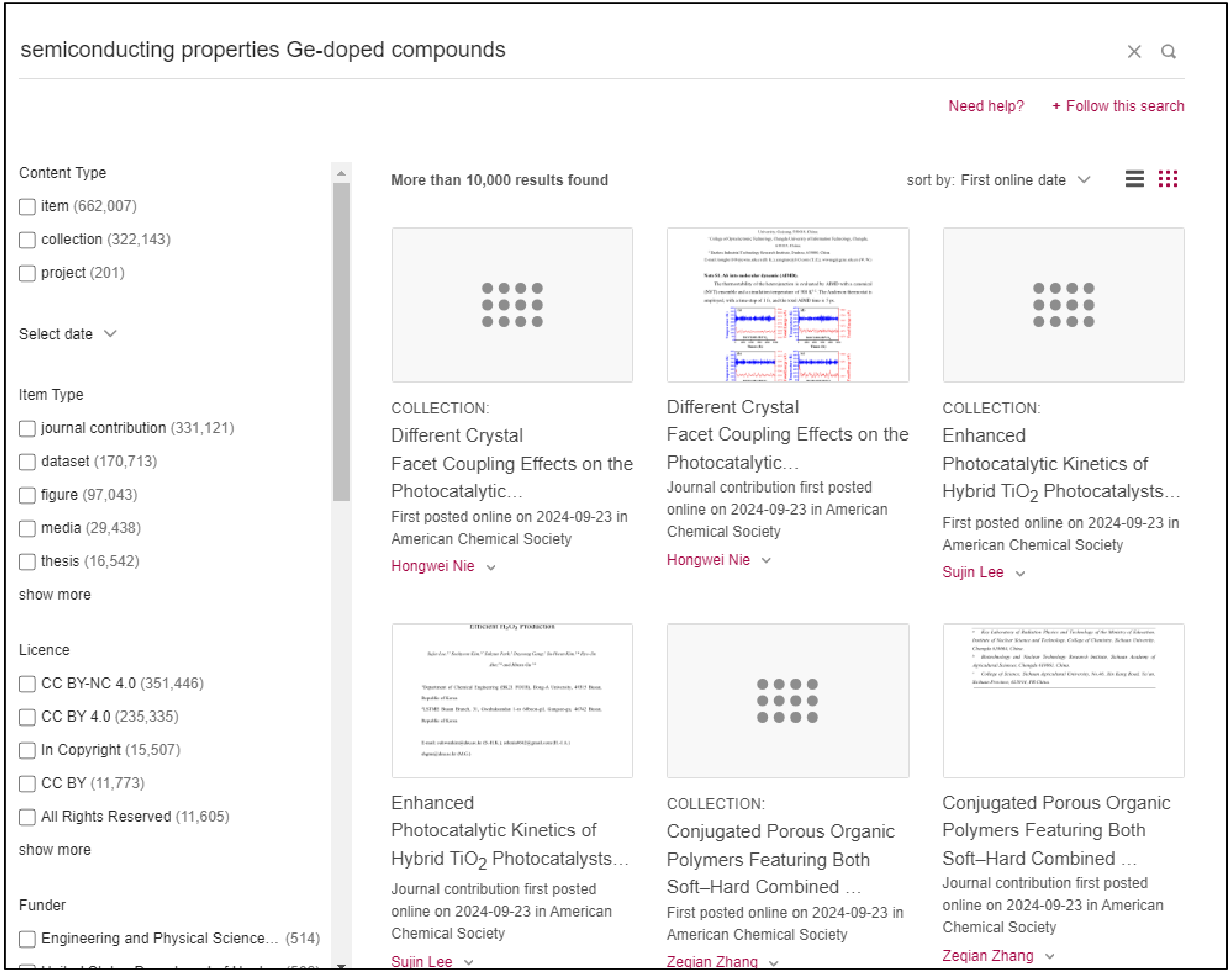

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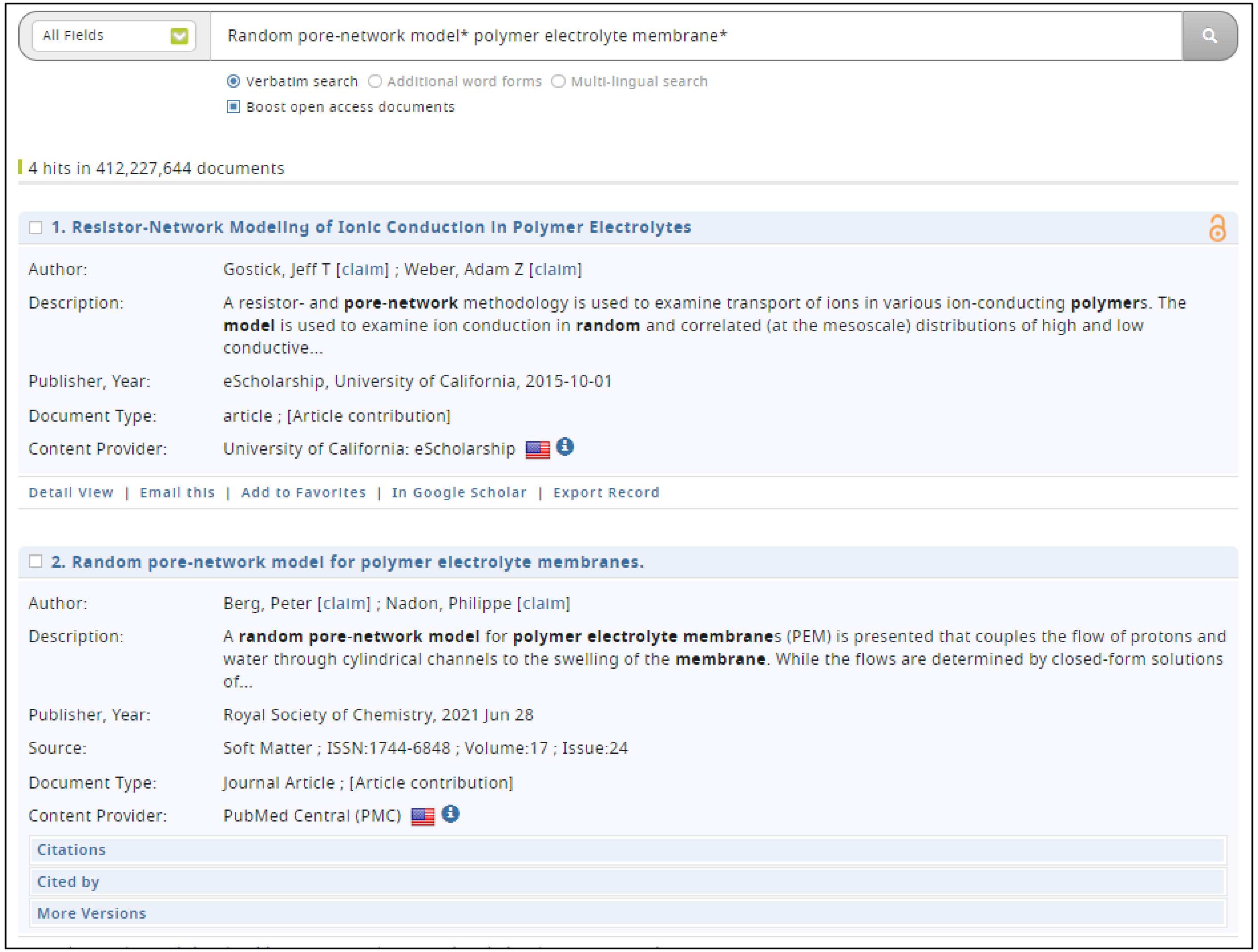

Random pore-network model* polymer electrolyte membrane*

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Author:	Berg, Peter [claim] ; Nadon, Philippe [claim]
Description:	A **random pore-network model** for **polymer electrolyte membrane**s (PEM) is presented that couples the flow of protons and water through cylindrical channels to the swelling of the **membrane**. While the flows are determined by closed-form solutions of...
Publisher, Year:	Royal Society of Chemistry, 2021 Jun 28
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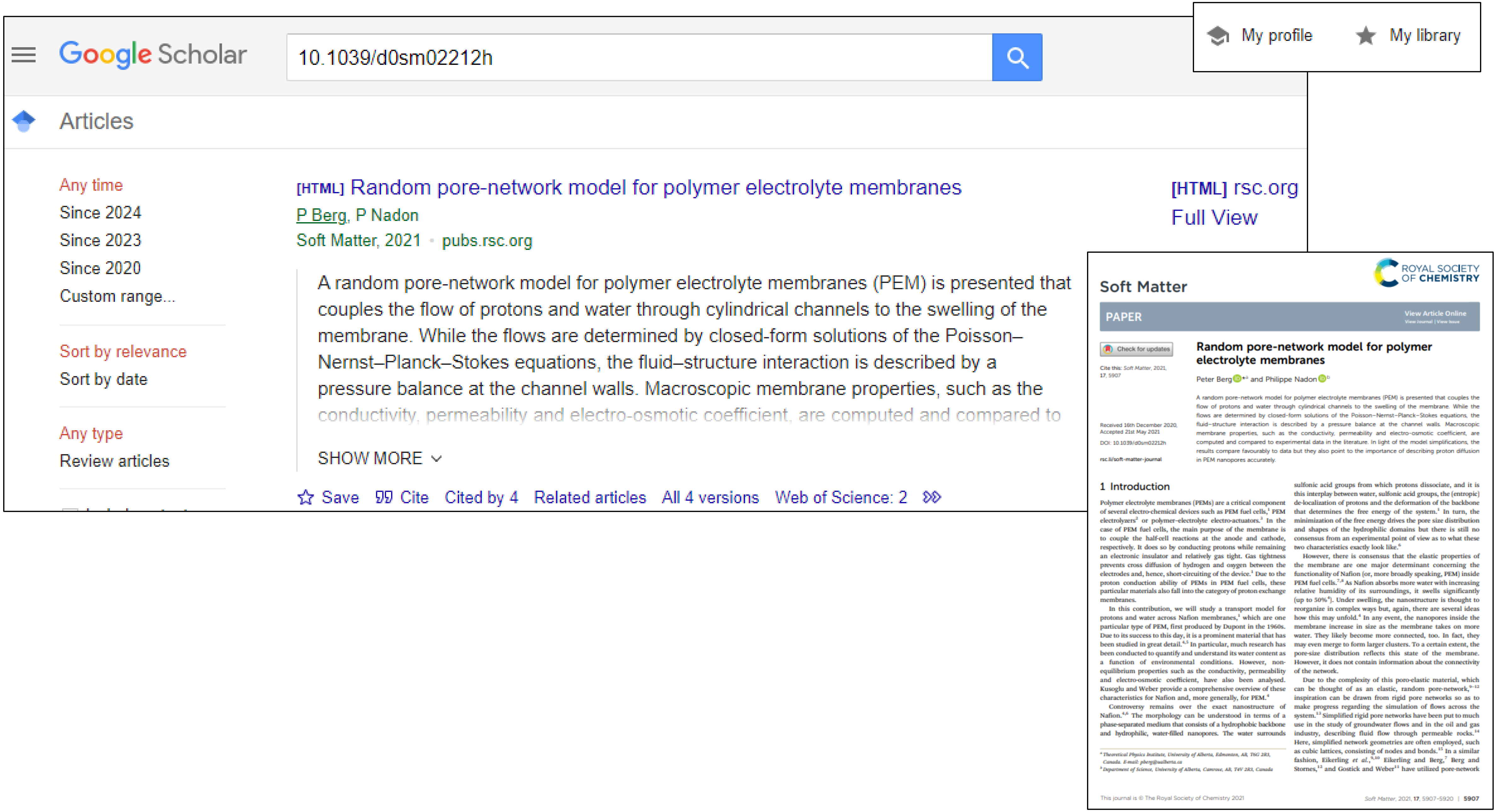

10.1039/d0sm02212h

[HTML] Random pore-network model for polymer electrolyte membranes

P Berg, P Nadon

Soft Matter, 2021 · pubs.rsc.org

A random pore-network model for polymer electrolyte membranes (PEM) is presented that couples the flow of protons and water through cylindrical channels to the swelling of the membrane. While the flows are determined by closed-form solutions of the Poisson–Nernst–Planck–Stokes equations, the fluid–structure interaction is described by a pressure balance at the channel walls. Macroscopic membrane properties, such as the conductivity, permeability and electro-osmotic coefficient, are computed and compared to

Soft Matter

Cite this: *Soft Matter*, 2021, 17, 5907

Random pore-network model for polymer electrolyte membranes

Peter Berg *[a] and Philippe Nadon [b]

A random pore-network model for polymer electrolyte membranes (PEM) is presented that couples the flow of protons and water through cylindrical channels to the swelling of the membrane. While the flows are determined by closed-form solutions of the Poisson–Nernst–Planck–Stokes equations, the fluid–structure interaction is described by a pressure balance at the channel walls. Macroscopic membrane properties, such as the conductivity, permeability and electro-osmotic coefficient, are computed and compared to experimental data in the literature. In light of the model simplifications, the results compare favourably to data but they also point to the importance of describing proton diffusion in PEM nanopores accurately.

Received 16th December 2020,
Accepted 21st May 2021

DOI: 10.1039/d0sm02212h

rsc.li/soft-matter-journal

1 Introduction

Polymer electrolyte membranes (PEMs) are a critical component of several electro-chemical devices such as PEM fuel cells,[1] PEM electrolyzers[2] or polymer–electrolyte electro-actuators.[3] In the case of PEM fuel cells, the main purpose of the membrane is to couple the half-cell reactions at the anode and cathode, respectively. It does so by conducting protons while remaining an electronic insulator and relatively gas tight. Gas tightness prevents cross diffusion of hydrogen and oxygen between the electrodes and, hence, short-circuiting of the device.[1] Due to the proton conduction ability of PEMs in PEM fuel cells, these particular materials also fall into the category of proton exchange membranes.

In this contribution, we will study a transport model for protons and water across Nafion membranes,[1] which are one particular type of PEM, first produced by Dupont in the 1960s. Due to its success to this day, it is a prominent material that has been studied in great detail.[4,5] In particular, much research has been conducted to quantify and understand its water content as a function of environmental conditions. However, non-equilibrium properties such as the conductivity, permeability and electro-osmotic coefficient, have also been analysed. Kusoglu and Weber provide a comprehensive overview of these characteristics for Nafion and, more generally, for PEM.[4]

Controversy remains over the exact nanostructure of Nafion.[4,6] The morphology can be understood in terms of a phase-separated medium that consists of a hydrophobic backbone and hydrophilic, water-filled nanopores. The water surrounds sulfonic acid groups from which protons dissociate, and it is this interplay between water, sulfonic acid groups, the (entropic) de-localization of protons and the deformation of the backbone that determines the free energy of the system.[1] In turn, the minimization of the free energy drives the pore size distribution and shapes of the hydrophilic domains but there is still no consensus from an experimental point of view as to what these two characteristics exactly look like.[6]

However, there is consensus that the elastic properties of the membrane are one major determinant concerning the functionality of Nafion (or, more broadly speaking, PEM) inside PEM fuel cells.[7,8] As Nafion absorbs more water with increasing relative humidity of its surroundings, it swells significantly (up to 50%[4]). Under swelling, the nanostructure is thought to reorganize in complex ways but, again, there are several ideas how this may unfold.[4] In any event, the nanopores inside the membrane increase in size as the membrane takes on more water. They likely become more connected, too. In fact, they may even merge to form larger clusters. To a certain extent, the pore-size distribution reflects this state of the membrane. However, it does not contain information about the connectivity of the network.

Due to the complexity of this poro-elastic material, which can be thought of as an elastic, random pore-network,[9–12] inspiration can be drawn from rigid pore networks so as to make progress regarding the simulation of flows across the system.[13] Simplified rigid pore networks have been put to much use in the study of groundwater flows and in the oil and gas industry, describing fluid flow through permeable rocks.[14] Here, simplified network geometries are often employed, such as cubic lattices, consisting of nodes and bonds.[15] In a similar fashion, Eikerling *et al.*,[9,10] Eikerling and Berg,[7] Berg and Stornes,[12] and Gostick and Weber[11] have utilized pore-network

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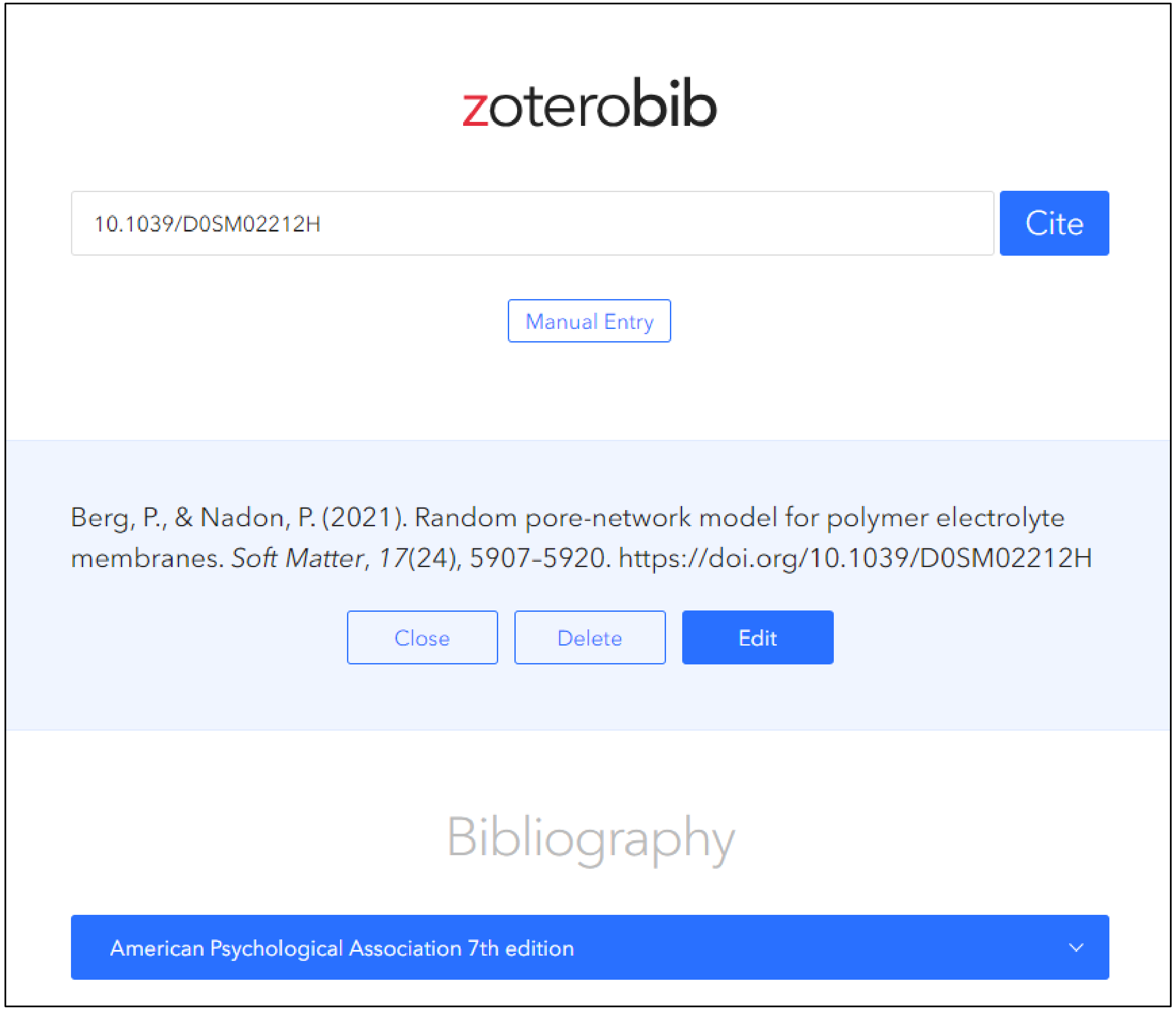

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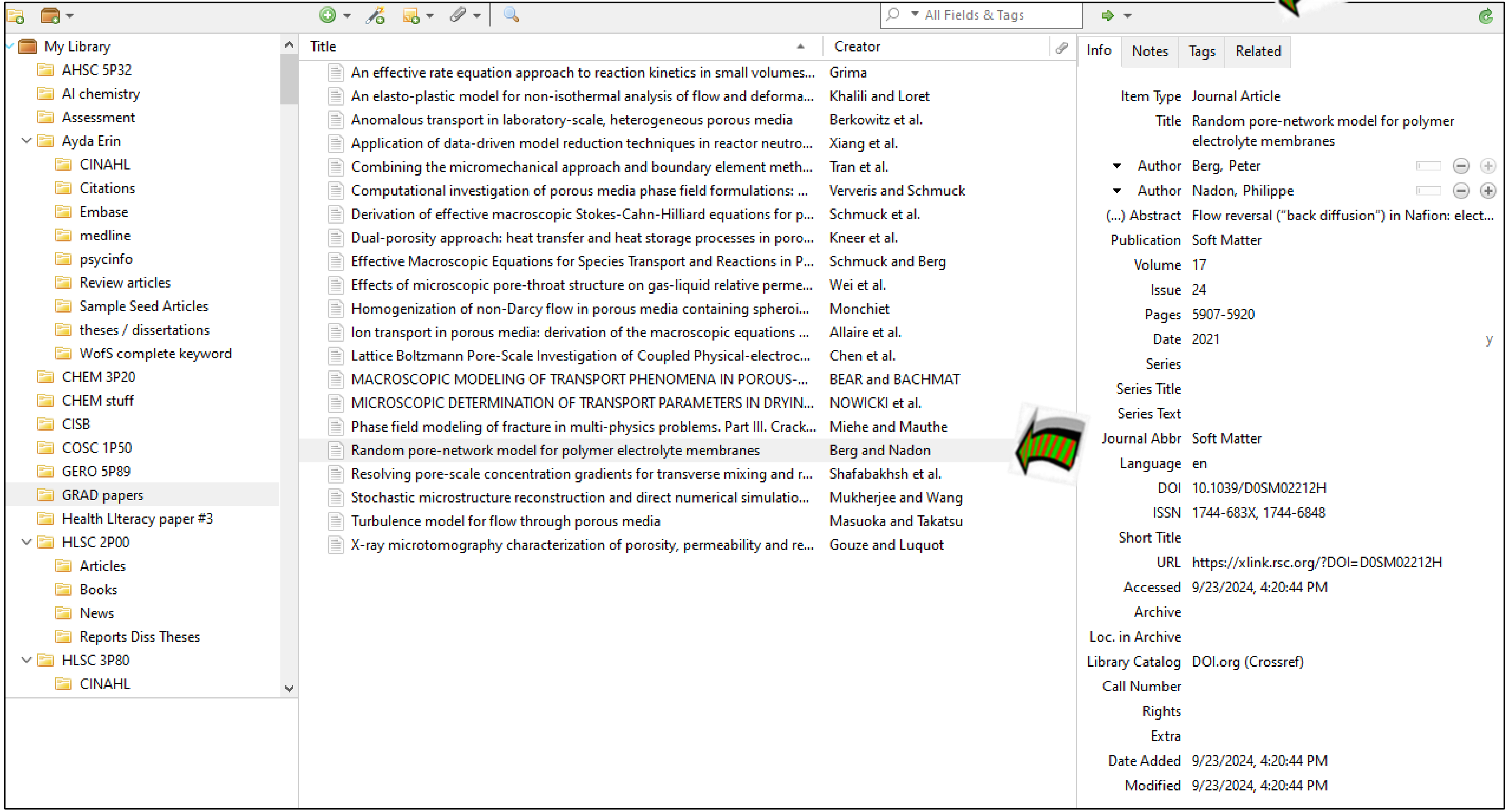

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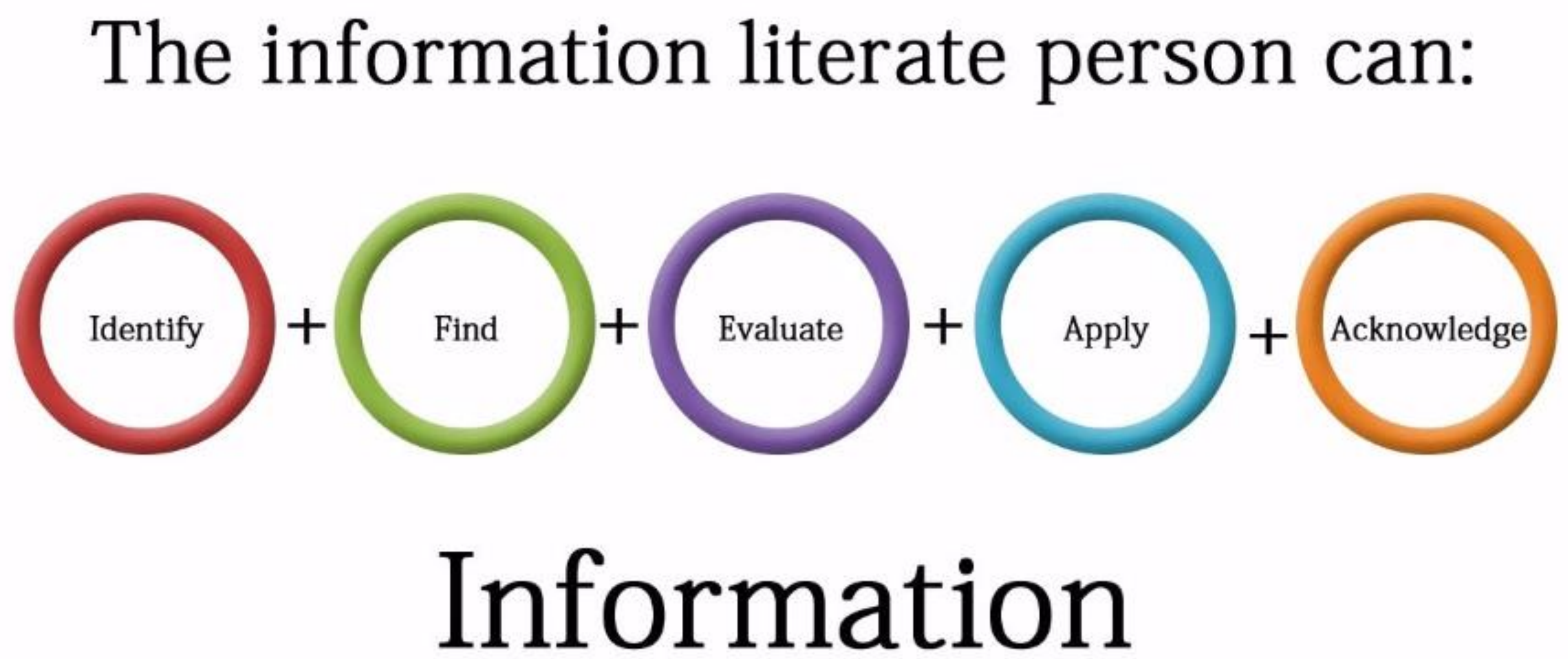

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